Claims

1. An information processing method of tabulating item values stored in plural processing modules, in an information processing system in which the plural processing modules are logically connected in a ring shape and each of the processing modules includes a memory that stores table format data representing an array of records including the item values corresponding to an item of information, in forms of a value list in which the item values are stored in an order of item value numbers corresponding to the item values and an array of pointers in which information for designating the item value numbers is stored in an order of the records, the information processing method comprising:

a step, in each of the processing modules, of storing in the memory global record numbers uniquely allocated to the records in the processing module among the plural processing modules and global item value numbers ordered with respect to item values in the processing module among the plural processing modules;

a step, in each of the processing modules, of sorting, in the processing module, the records in an order determined according to a set of global item value numbers of at least one or more designated items;

a step, in each of the processing modules, of storing a set of global item value numbers corresponding to the records

in the memory, said set of global item value numbers being associated with dimension value numbers representing orders of the sorted records to the set of global item value numbers;

a step, in each of the processing modules, of mutually acquiring sets of global item value numbers from the other processing modules, counting a number of sets of global item value numbers ordered higher than the set of global item value numbers in the processing module, and allocating global dimension value numbers, which are common among the plural processing modules, to the sets of global item value numbers by increasing the dimension value number of the set of global item value numbers in the processing module by the counted number;

a step, in each of the processing modules, of calculating, for each of the sets of global item value numbers, a local tabulated value by tabulating item values of predetermined items of information in accordance with a predetermined rule; and

a step, in each of the processing modules, of acquiring local tabulated values for each of the sets of global item value numbers from the other processing modules and calculating a tabulated value by tabulating the tabulated values acquired for each of the sets of global item value numbers.

2. An information processing method according to claim 1, after the step of calculating a tabulated value, further

comprising a step, in each of the processing modules, of restoring a set of item values from the set of global item value numbers and creating a result table including the set of item values and the tabulated value corresponding to the set of item values.

3. An information processing system in which plural processing modules are logically connected in a ring shape and each of the processing modules includes a memory that stores table format data presenting an array of records including item values corresponding to an item of information, in forms of a value list in which the item values are stored in an order of item value numbers corresponding to the item values and an array of pointers in which information for designating the item value numbers is stored in an order of the records, wherein

each of the processing modules stores, in the memory, global record numbers uniquely allocated to the records in the processing module among the plural processing modules and global item value numbers ordered with respect to item values in the processing module among the plural processing modules, and

each of the processing modules includes:

local sort means for sorting, in the processing module, the records in an order determined according to a set of global item value numbers of at least one or more designated items;

dimension value numbering means for storing a set of

global item value numbers corresponding to the records in the memory, said set of global item value numbers being associated with dimension value numbers in an order of the sorted records to the set of global item value numbers;

global dimension value numbering means for mutually acquiring sets of global item value numbers from the other processing modules, counting a number of sets of global item value numbers ordered higher than the set of global item value numbers in the processing module, and allocating global dimension value numbers, which are common among the plural processing modules, to the sets of global item value numbers by increasing the dimension value number of the set of global item value numbers in the processing module by the counted number;

tabulating means for calculating, for each of the sets of global item value numbers, a local tabulated value by tabulating item values of predetermined items of information in accordance with a predetermined rule; and

global tabulating means for acquiring local tabulated values for each of the sets of global item value numbers from the other processing modules and calculating a tabulated value by tabulating the tabulated values acquired for each of the sets of global item value numbers.

4. An information processing system according to claim 3, wherein each of the processing modules further includes

means for restoring a set of item values from the set of global item value numbers and creating a result table including the set of item values and the tabulated value corresponding to the set of item values, the means being connected to the global tabulating means.

5. A program for causing a computer of a processing module in an information processing system to execute the following steps, in which plural processing modules are logically connected in a ring shape and each of the processing modules includes a memory that stores table format data representing an array of records including the item values corresponding to an item of information, in forms of a value list in which the item values are stored in an order of item value numbers corresponding to the item values and an array of pointers in which information for designating the item value numbers is stored in an order of the records, the steps comprising:

a step of storing, in the memory, global record numbers uniquely allocated to records in the processing module among the plural processing modules and global item value numbers ordered with respect to item values in the processing module among the plural processing modules;

a step of sorting, in the processing module, the records in an order set according to a set of global item value numbers of at least one or more designated items;

a step of storing a set of global item value numbers corresponding to the records in the memory, said set of global item value numbers being associated with dimension value numbers representing orders of the sorted records to the set of global item value numbers;

a step of mutually acquiring sets of global item value numbers from the other processing modules, counting a number of sets of global item value numbers ordered higher than the set of global item value numbers in the processing module, and allocating global dimension value numbers, which are common among the plural processing modules, to the sets of global item value numbers by increasing the dimension value number of the set of global item value numbers in the processing module by the counted number;

a step of calculating, for each of the sets of global item value numbers, a local tabulated value by tabulating item values of predetermined items of information in accordance with a predetermined rule; and

a step, in each of the processing modules, of acquiring local tabulated values for each of the sets of global item value numbers from the other processing modules and calculating a tabulated value by tabulating the tabulated values acquired for each of the sets of global item value numbers.

6. A program according to claim 5, after the step of calculating a tabulated value, further causing the computer

of the processing module to execute a step of restoring a set of item values from the set of global item value numbers and creating a result table including the set of item values and the tabulated value corresponding to the set of item values.

7. An information processing method of allocating order numbers, which are common among plural processing modules, to values ordered individually in each of the processing modules in an information processing system in which the plural processing modules that have memories storing a list of the ordered values, respectively, are logically connected in a ring shape, the information processing method comprising:

a step, in each of the processing modules, of storing in the memory initial values of order numbers corresponding to the respective values in the list of values in the processing module;

a first transmission step, in each of the processing modules, of transmitting the list of values stored in the memory of the processing module to a processing module logically connected to the next stage;

a first update step, in each of the processing modules, of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in a list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in

the list of values in the processing module by increasing the order numbers of the respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory;

a second transmission step, in each of the processing modules, of transmitting a further list of values to the processing module logically connected to the next stage, said further list of values being obtained by excluding values coinciding with the values in the list of values in the processing module from the values in the list of values received from the processing module logically connected to the preceding state;

a second update step, in each of the processing modules, of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in the further list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of the respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory; and

a step, in each of the processing modules, of repeatedly executing the second transmission step and the second update step until the list of values transmitted to the processing

module logically connected to the next stage in the first transmission step is received by the processing module logically connected to the preceding stage via the other processing modules logically connected in a ring shape.

8. An information processing system including plural processing modules that have memories storing a list of ordered values, respectively, and a transmission path that logically connects the plural processing modules in a ring shape, the information processing system allocating order numbers, which are common among the plural processing modules, to the values in the list of values in each of the processing modules, wherein

each of the processing modules includes:

initializing means for storing, in the memory, initial values of the order numbers of the respective values in the list of values in the processing module and transmitting the list of values stored in the memory of the processing module to a processing module logically connected to the next stage;

receiving means for receiving a list of values from a processing module logically connected to the preceding stage;

updating means for counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in the list of values received by the receiving means, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of

the respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory;

transmitting means for transmitting a further list of values to the processing module logically connected to the next stage, said further list being obtained by excluding values coinciding with the values in the list of values in the processing module from the values in the list of values received by the receiving means; and

control means for starting the initializing means and causing the receiving means, the updating means, and the transmitting means to repeatedly operate until the list of values transmitted by the initializing means is received by the processing module logically connected to the preceding stage via the other processing modules logically connected in a ring shape.

9. A program for causing a computer to execute the information processing method in an information processing system in which plural processing modules that have memories storing a list of ordered values, respectively, are logically connected in a ring shape, the program causing a computer of a processing module to execute:

a step of storing, in the memory, initial values of order numbers of the respective values in the list of values in the processing module;

a first transmission step of transmitting the list of values stored in the memory of the processing module to a processing module logically connected to the next stage;

a first update step of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in a list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of the respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory;

a second transmission step of transmitting a further list of values to the processing module logically connected to the next stage, said further list being obtained by excluding values coinciding with the values in the list of values in the processing module from the values in the list of values received;

a second update step of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in the further list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of the

respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory; and

a step of repeatedly executing the second transmission step and the second update step until the list of values transmitted to the processing module logically connected to the next stage in the first transmission step is received by the processing module logically connected to the preceding stage via the other processing modules logically connected in a ring shape.

10. An information processing method of allocating order numbers, which are common among plural processing modules to values held individually in each of the processing modules in an information processing system in which the plural processing modules that have memories storing a list of values, respectively, are logically connected in a ring shape, the information processing method comprising:

a step, in each of the processing modules, of storing in the memory initial values of order numbers corresponding to the respective values in the list of values in the processing module;

a first transmission step, in each of the processing modules, of transmitting the list of values stored in the memory of the processing module to a processing module logically connected to the next stage;

a first update step, in each of the processing modules, of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in a list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of the respective values in the list of values in the processing module by the counted number, and storing the order numbers updated in the memory;

a second transmission step, in each of the processing modules, of transmitting a further list of values to the processing module logically connected to the next stage, said further list being obtained by excluding values coinciding with the values in the list of values in the processing module from the values in the list of values received;

a second update step, in each of the processing modules, of counting, with respect to the respective values in the list of values in the processing module, a number of values ordered higher than the respective values in the further list of values received from a processing module logically connected to the preceding stage, updating the order numbers of the respective values in the list of values in the processing module by increasing the order numbers of the respective values in the list of values in the processing module by the counted number,

89

and storing the order numbers updated in the memory; and

a step, in each of the processing modules, of repeatedly executing the second transmission step and the second update step until the list of values transmitted to the processing module logically connected to the next stage in the first transmission step is received by the processing module logically connected to the preceding stage via the other processing modules logically connected in a ring shape.